Comments related to aquifer flow rates

00458	Ex. 6 Personal Privacy (PP)	ndividual	When tritium from nuclear fallout moved through groundwater in the Inya Kara Group at fifteen feet per day it indicated possible flaws in the rocks, or porous lenses. This data was either ignored or explained away. A recent paper said the 1963 tritium data showing much faster velocity is an unresolved issue. (South Dakota Academy of Science, Vol. 93 (2014) p. 28.) Rahn 2014 Permeability Inyan Kara.pdf
8291	Charmaine White Face	Defenders of the Black Hills	Dear Ms. Robinson: These are our comments on Docket ID: EPA-R08-0W-2019-0512 on two Underground Injection Control (UIC) Draft Area Permits and one associated proposed aquifer exemption decision for the Dewey-Burdock uranium in-situ recovery (ISR) site located near Edgemont, South Dakota, under the authority of the Safe Drinking Water Act and UIC program regulations. These comments are being submitted by Charmaine White Face, Coordinator, on behalf of Defenders of the Black Hills which organization still works on issues involving Uranium extraction. We strongly oppose the EPA Region 8 UIC Program reissuing two Draft UIC Area Permits to Powertech (USA) Inc./Azarga for injection activities related to uranium recovery, and the aquifer exemption approval in connection with the Class III Area Permit to exempt the uranium-bearing portions of the Inyan Kara Group aquifers for the following reasons. 1. Groundwater Resources in South Dakota Our concern for the groundwater resources in South Dakota is based on a number of scientific studies conducted by geologists since the early 1900s, most notably N.H. Darton. His work in the difference of topographic elevation providing the principal driving force for regional groundwater flow through aquifers, and of course Isaac Newton' s law of gravity are two of the most compelling reasons why these In Situ Recovery (ISR) plans must not be allowed to continue. From the Geological Society of America Special Paper 189 (1982) entitled "Regional Ground-Water Flow Concepts in the United States: Historical Perspective" come two of the most obvious reasons: [spe189-0295.pdf] "1. Differences in hydraulic head produced by topographic relief on the boundaries of the flow system are, in most instances, the driving force for the flow. 2. Most naturally occurring earth materials have finite permeability; there are no totally impermeable materials. In sedimentary deposits [which these Uranium deposits are] significant quantities of flow commonly occur through shaley confining layers." (P. 297) Although relatively small when compared with the entire region of the Black Hills, this geographic area planned to be mined by Powertech/Azarga does play a role in the water recharge area of many aquifers. These aquifers have an influence on the entire state of South Dakota so the reach of the contamination will be much larger than anticipated or modeled. As stated on page 299 of Special Paper 189 as previously noted:

			"The Dakota aquifer in South Dakota is the classic artisian aquifer. Many modern ideas concerning artesian aquifers stem from N.H. Darton's investigation of the Dakota aquifer during the 1890s and early 1900s. Darton recognized that the recharge to the system occurred in the Black Hills in western South Dakota while the major discharge was in eastern South Dakota, 300-500 km to the east." N. H. Darton (1865-1948) studied extensively the geology of the Great Plains and Rocky Mountain Region, and is considered one of the most prominent geologists of the twentieth century. Darton is further quoted in Special Paper 189 as saying: "Another factor which undoubtedly somewhat influxes the hydraulic grade in the Great Plains region is a certain but unknown amount of general leakage through the so-called impermeable strata, especially when under great pressure." There are two issues in question here: pressure and leakage. The pressure in this case is the pressure of gravity as the potentiometric maps of South Dakota, particularly Darton's from 1909, which have never been disproven, show the flow going from West to East, or from the higher elevation to the lower, from the Black Hills to Eastern South Dakota. Although the land area in question in this proposal to mine is on the southwestern side of the Black Hills, in a study by Daniel G. Driscoll, Hydrology of the Black Hills Area, South Dakota, Issue 2, Parts 4094-4095, p. 112, the ground flow turns at the base of the Black Hills from going southwest and turning to the east. Again, this will impact other aquifers as stated by Darton and especially aquifers in Eastern South Dakota where the majority of population lives and the majority of farming occurs. [...] Furthermore, the chemical reactions that will be occurring with the addition of lixiviant will occur not just to the Uranium deposits but also with other elements present in the soil. This is further reiterated in Special Paper 189 as stated previously: "3. Chemical reactions within the flow system occur in the moving fluid-ground water. The chemical evolution within the system can be utilized to understand the flow better." This is the very idea behind ISR mining and the proposal by Powertech/Azarga. South Dakota School of Mines and Technology Professor Perry Rahn in a paper presented to the South Dakota Academy of Science adds: "The chemistry of groundwater at an abandoned ISL uranium mine will be changed from its pre-mine condition. The amount of chemical change and the groundwater velocity downgradient from the mined site are important for any environmental assessment. The chemistry of this water will be greatly altered. Elements such as uranium, radium, and selenium will be dissolved by chemicals during the mining operation. These elements originally were bound up within the Inyan Kara aquifer as solid minerals. Solution mining will set them free as dissolved constituents in the groundwater. Their concentration and mobility within the aquifer is uncertain. The ultimate fate of groundwater contaminants from an ISL uranium mine depends on the groundwater velocity and the natural attenuation that could immobilize contaminants such as uranium and selenium." Perry Rahn, "Permeability of the Inyan Kara Group in the Black Hills Area and Its Relevance to a Proposed In-Situ Leach Uranium Mine", Proceedings of the South Dakota Academy of Science, Vol. 93 (2014) p. 28
00527	Lilias Jones Jarding, Ph.D.	Clean Water Alliance	The applicant's project has also changed in important respects between the time the NRC began considering it and the time the EPA began considering it. Examples include: • NRC documents consider the use of 4,000 gallons of water per minute for the mining and reclamation process. The EPA applications consider the use of 9,000 gpm, more than twice as much water. • This project was originally described as involving 1,500 injection, recovery, and monitoring wells. By the time the EPA issued its draft permits, this had grown to 4,000 wells, nearly three times more wells.

			• The projected bleed rates have varied over time, from .5% of the water used to 17% of the water used. In addition, the reverse osmosis process makes at least 30% of the water put through the RO process into waste, and this is not fully considered in the EPA documents. This seriously weakens all the assumptions and calculations on water use in the Class III draft permit and in the Draft Cumulative Effects Analysis. Documents prepared by Petrotek for Powertech/Azarga set subsurface water movement rates at 6 to 7 feet per year (without offering peer-reviewed sources). NRC documents set the transmissivity rate in the Fall River formation at 255 ft.^{2} per day and in the Lakota formation at 150 ft.^{2} per day. Dr. Perry Rahn's 2014 article, mentioned above, concluded that the average ground water velocity for the Lakota and Fall River formations in the Dewey-Burdock area was 66.1 ft./year. But, he said, groundwater velocity in the Inyan Kara Aquifers at the Dewey-Burdock site might be as much as 5,480 feet per year – over a mile -- which "might indicate fast groundwater movement through very permeable units or through fractures," although he considered this number "very high." The draft permits omit this critical information that could have very real impacts on wells that are downgradient of the proposed mine site. This issue is critically important, and further independent studies should be done before any permit is issued
00528	David Frankel	Aligning for Responsible Mining	• Documents prepared by Petrotek for Powertech/Azarga set subsurface water movement rates at 6 to 7 feet per year (without offering a source). NRC documents set the transmissivity rate in the Fall River formation at 255 ft.2 per day and in the Lakota formation at 150 ft.2 per day. **Which is it?** • Dr. Perry Rahn, Professor Emeritus from the South Dakota School of Mines and the acknowledged expert in these matters, said in a 2014 speech (which has since been submitted for publication) that groundwater velocity in the Inyan Kara Aquifers at the Dewey-Burdock site might be as much as 5,480 feet per year – over a mile -- which "might indicate fast groundwater movement through very permeable units of through fractures." The draft permits omit this critical information that could have very real impacts on wells that are downgradient of the proposed mine site.